

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau



(43) International Publication Date
19 February 2004 (19.02.2004)

PCT

(10) International Publication Number
WO 2004/015521 A3

(51) International Patent Classification⁷: **G06F 12/08, 15/16**

117 Cronin Drive, Santa Clara, CA 95051 (US). LEE, Herman; 600 Rainbow Drive, #160, Mountain View, CA 94041 (US). RAJAN, Vijayan; 431 Costa Mesa Terrace #A, Sunnyvale, CA 94085-1612 (US). PITTMAN, Joseph, C.; 1002 Oakwell Court, Apex, NC 27502 (US).

(21) International Application Number: PCT/US2003/023597

(74) Agent: LOGINOV, William, A.; Cesari and McKenna, LLP, 88 Black Falcon Avenue, Boston, MA 02210 (US).

(22) International Filing Date: 28 July 2003 (28.07.2003)

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.

(25) Filing Language: English

(81) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),

(26) Publication Language: English

(81)

(30) Priority Data:
10/215,917 9 August 2002 (09.08.2002) US

(81)

(71) Applicant: NETWORK APPLIANCE, INC. [US/US]; 495 East Java Drive, Sunnyvale, CA 94089 (US).

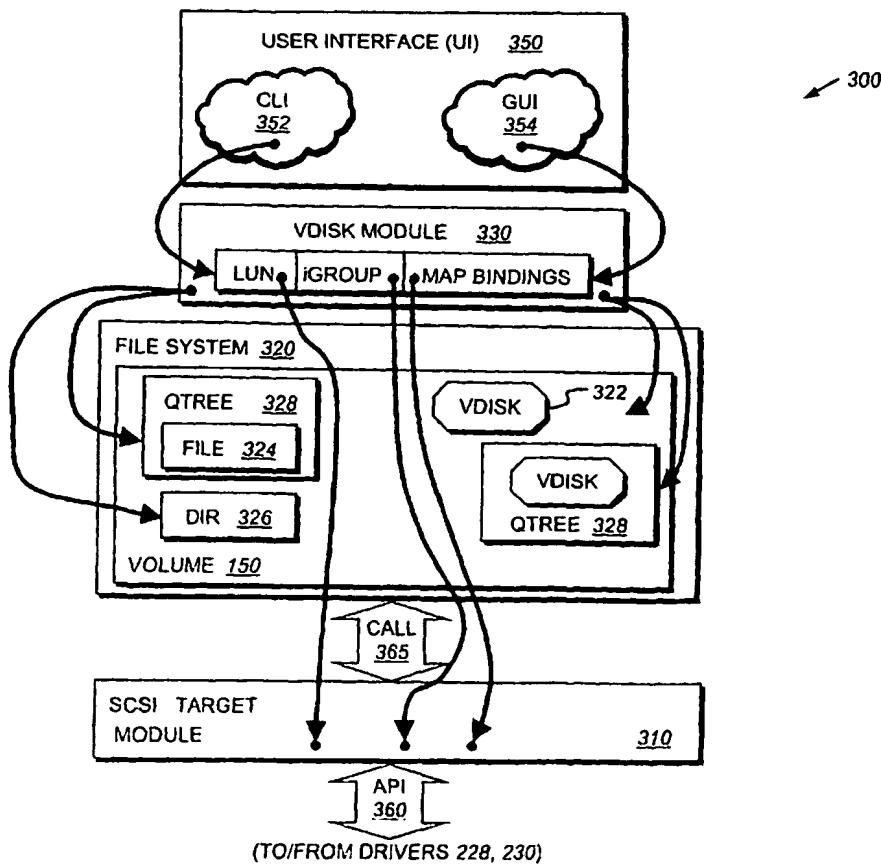
(81)

(72) Inventors: PAWLOWSKI, Brian; 1156 Hamilton Avenue, Palo Alto, CA 94301 (US). SRINIVASAN, Mohan;

(81)

[Continued on next page]

(54) Title: MULTI-PROTOCOL STORAGE APPLIANCE THAT PROVIDES INTEGRATED SUPPORT FOR FILE AND BLOCK ACCESS PROTOCOLS



(57) Abstract: A multi-protocol storage appliance serves file and block protocol access to information stored on storage devices in an integrated manner for both network attached storage (NAS) and storage area network (SAN) deployments. A storage operating system of the appliance implements a file system (320) that cooperates with novel virtualization modules to provide a virtualization system (300) that "virtualizes" the storage space provided by the devices. The file system provides volume management capabilities for use in block-based access to the information stored on the devices. The virtualization system (300) allows the file system to logically organize the information as named file (324), directory (326) and virtual disk storage objects (322, 328) to thereby provide an integrated NAS and SAN appliance approach to storage by enabling file based access to the files and directories while further enabling block-based access to the virtual disks.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/23597

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 12/08, 15/16
US CL : 709/211, 245; 711/203

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 709/208, 211, 217, 219, 230, 245; 711/117, 147, 148, 202, 203

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, E	US 6,606,690 B2 (PADOVANO) 12 AUGUST 2003 Abstract, Column 2, Lines 15-34, Column 3, Lines 1-39, Column 5, Lines 1-54, Column 9, Lines 38-48, Column 10, Lines 1-32, Column 22, Lines 47-62	1-27
A	CALLAGHAN, B. "NFS Version 3 Protocol Specification", Request for Comments (RFC) 1813, June 1995	1-27
A	US 6,185,655 B1 (PEPING) 06 FEBRUARY 2001 Entire document	1-27
A, P	LU, Y. "Performance Study of iSCSI-Based Storage Subsystems", IEEE Communications Magazine, pp. 76-82, August 2003	1-27

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

26 March 2004 (26.03.2004)

Date of mailing of the international search report

14 APR 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Facsimile No. (703) 305-3230

Authorized officer

Marc D. Thompson

Telephone No. 703-305-3900